General

Guideline Title

Hyperglycaemia in acute coronary syndromes. Management of hyperglycaemia in acute coronary syndromes.

Bibliographic Source(s)

National Institute for Health and Clinical Excellence (NICE). Hyperglycaemia in acute coronary syndromes. Management of hyperglycaemia in acute coronary syndromes. London (UK): National Institute for Health and Clinical Excellence (NICE); 2011 Oct. 19 p. (Clinical guideline; no. 130).

Guideline Status

This is the current release of the guideline.

Recommendations

Major Recommendations

Note from the National Guideline Clearinghouse (NGC): This guideline was developed by the National Clinical Guideline Centre (NCGC) at the National Institute for Health and Clinical Excellence (NICE). See the "Availability of Companion Documents" field for the full version of this guidance.

Managing Hyperglycaemia in Inpatients within 48 Hours of Acute Coronary Syndrome (ACS)

Recommendations in this section partially update recommendation 1.12.3.6 in the NICE guideline Type 1 diabetes . Recommendation 1.12.3.6 is updated for the treatment of patients with threatened or actual myocardial infarction, but not stroke.

Manage hyperglycaemia in patients admitted to hospital for an ACS by keeping blood glucose levels below 11.0 mmol/litre while avoiding hypoglycaemia. In the first instance, consider a dose-adjusted insulin infusion with regular monitoring of blood glucose levels.

Do not routinely offer intensive insulin therapy (an intravenous infusion of insulin and glucose with or without potassium) to manage hyperglycaemia (blood glucose above 11.0 mmol/litre) in patients admitted to hospital for an ACS unless clinically indicated.

Identifying Patients with Hyperglycaemia after ACS Who Are at High Risk of Developing Diabetes

Offer all patients with hyperglycaemia after ACS and without known diabetes tests for:

- Glycosylated haemoglobin (HbA_{1c}) levels before discharge and
- Fasting blood glucose levels no earlier than 4 days after the onset of ACS

These tests should not delay discharge.

Do not routinely offer oral glucose tolerance tests to patients with hyperglycaemia after ACS and without known diabetes if HbA_{1c} and fasting blood glucose levels are within the normal range.

Advice and Ongoing Monitoring for Patients with Hyperglycaemia after ACS and without Known Diabetes

Offer patients with hyperglycaemia after ACS and without known diabetes lifestyle advice on the following:

- Healthy eating in line with the NICE guidelines Post myocardial infarction: secondary prevention in primary and secondary care for patients following a myocardial infarction and Obesity
- Physical exercise in line with the NICE guidelines Post myocardial infarction: secondary prevention in primary and secondary care for patients following a myocardial infarction and Four commonly used methods to increase physical activity
- Weight management in line with the NICE guidelines Post myocardial infarction: secondary prevention in primary and secondary care for patients following a myocardial infarction and Obesity
- Smoking cessation in line the NICE guidelines Unstable angina and NSTEMI: the early management of unstable angina and non-ST-segment-elevation myocardial infarction, Smoking cessation services in primary care, pharmacies, local authorities and workplaces, particularly for manual working groups, pregnant women and hard to reach communities, and Post myocardial infarction: secondary prevention in primary and secondary care for patients following a myocardial infarction, and Brief interventions and referral for smoking cessation
- Alcohol consumption in line with the NICE guideline Post myocardial infarction: secondary prevention in primary and secondary care for patients following a myocardial infarction.

Advise patients without known diabetes that if they have had hyperglycaemia after an ACS they:

- Are at increased risk of developing type 2 diabetes
- Should consult their general practitioner (GP) if they experience the following symptoms:
  - Frequent urination
  - Excessive thirst
  - Weight loss
  - Fatigue
- Should be offered tests for diabetes at least annually

Inform GPs that they should offer at least annual monitoring of HbA_{1c} and fasting blood glucose levels to people without known diabetes who have had hyperglycaemia after an ACS.

Clinical Algorithm(s)

A hyperglycaemia in acute coronary syndromes care pathway is provided in the full version of the original guideline document (see the "Availability of Companion Documents" field).

Scope

Disease/Condition(s)

Hyperglycaemia associated with acute coronary syndrome

Guideline Category

Counseling

Diagnosis

Management

Treatment

Clinical Specialty

Cardiology

Endocrinology

Internal Medicine

Intended Users

Advanced Practice Nurses

Hospitals

Nurses

Physician Assistants

Physicians

Guideline Objective(s)

- To offer best practice advice on the management of hyperglycaemia in all adults admitted to hospital for an acute coronary syndrome regardless of whether or not they have a diagnosis of diabetes
- To address the role of intensive insulin therapy in managing hyperglycaemia within the first 48 hours in people admitted to hospital for acute coronary syndromes

Target Population

- Adults with acute coronary syndromes and hyperglycaemia with a diagnosis of diabetes
- Adults with acute coronary syndromes and hyperglycaemia without a diagnosis of diabetes
- Subgroups who are at higher risk of mortality and poorer outcomes associated with acute coronary syndrome, as appropriate

Note: Groups not covered:

Adults with hyperglycaemia who do not have acute coronary syndromes
Adults with acute coronary syndromes who do not have hyperglycaemia

Interventions and Practices Considered

1. Managing hyperglycaemia in inpatients within 48 hours of acute coronary syndrome (ACS)
    - Dose-adjusted insulin infusion to keep blood glucose levels below 11.0 mmol/litre while avoiding hypoglycaemia
    - Regular monitoring of blood glucose levels
2. Identifying patients with hyperglycaemia after ACS who are at high risk of developing diabetes
    - Tests for glycosylated haemoglobin (HbA_{1c} levels) before discharge
    - Fasting blood glucose levels no earlier than 4 days after the onset of ACS
3. Advice and ongoing monitoring for patients with hyperglycaemia after ACS and without known diabetes

Major Outcomes Considered

- All-cause mortality
- Cardiovascular mortality
- Cardiovascular events such as non-fatal reinfarction, heart failure and stroke
- Measures and control of blood glucose levels
- Health related quality of life
- Adverse events associated with metabolic management of hyperglycaemia, including hypoglycaemia and hypokalaemia
- Resource use and costs, such as length of hospital stay

Methodology

Methods Used to Collect/Select the Evidence

Hand-searches of Published Literature (Primary Sources)

Hand-searches of Published Literature (Secondary Sources)

Searches of Electronic Databases

Searches of Unpublished Data

Description of Methods Used to Collect/Select the Evidence

Note from the National Guideline Clearinghouse (NGC): This guideline was developed by the National Clinical Guideline Centre (NCGC) at the National Institute for Health and Clinical Excellence (NICE). See the "Availability of Companion Documents" field for the full version of this guidance.

Search Strategies

The evidence reviews used to develop the guideline recommendations were underpinned by systematic literature searches, following the methods described in 'The guidelines manual' (2009) (see the "Availability of Companion Documents" field). The aim of the systematic searches was to comprehensively identify the published evidence to answer the review questions developed by the Guideline Development Group and Short Clinical Guidelines Technical Team.

The search strategies for the review questions were developed by the Information Services Team with advice from the Short Clinical Guidelines Technical Team. Structured questions were developed using the PICO (population, intervention, comparison, outcome) model and translated into search strategies using subject heading and free text terms. The strategies were run across a number of databases with no date restrictions imposed on the searches.

The NHS Economic Evaluation Database (NHS EED) and the Health Economic Evaluations Database (HEED) were searched for economic evaluations. Search filters for economic evaluations and quality of life studies were used on bibliographic databases. There were no date restrictions imposed on the searches.

Guideline Development Group members were also asked to alert the Short Clinical Guidelines Technical Team to any additional evidence, published, unpublished or in press, that met the inclusion criteria.

The searches were undertaken between June 2010 and September 2010.

Scoping Searches

Scoping searches were undertaken in May 2010 using the websites and databases listed in Appendix D of the full version of the original guideline document; browsing or simple search strategies were employed. The search results were used to provide information for scope development and project planning.

Review Questions

1. What is the optimal inpatient metabolic management of patients presenting with hyperglycaemia and acute coronary syndrome (ACS) who have diagnosed diabetes mellitus and hyperglycaemia?

2. What is the optimal inpatient metabolic management of patients presenting with hyperglycaemia and ACS without a diagnosis of diabetes mellitus?
3. What risk factors are associated with diabetes in patients with hyperglycaemia and ACS who have not previously been diagnosed?
4. What information should patients with peri-ACS and hyperglycaemia (who are at high risk of developing diabetes) be provided while waiting for a referral for diagnostic investigations for diabetes?

Main Searches

The following sources were searched:

- Clinical Trials.gov
- Current Controlled Trials
- Cochrane Database of Systematic Reviews – CDSR (Wiley)
- Cochrane Central Register of Controlled Trials – CENTRAL (Wiley)
- Database of Abstracts of Reviews of Effects – DARE (CRD)
- Health Technology Assessment Database – HTA (CRD)
- CINAHL (EBSCO)
- EMBASE (Ovid)
- MEDLINE (Ovid)
- MEDLINE In-Process (Ovid)
- National Research Register Archive
- UK Clinical Research Network

Refer to Appendix D of the full version of the original guideline for details of the search strategies used.

Number of Source Documents

- Review Question 1: 3 studies were included in the quantitative summary
- Review Question 2: 3 studies were included in the quantitative summary
- Review Question 3: 4 studies were included in the quantitative summary
- Review Question 4: 0 studies were included in the quantitative summary

See the "Description of Methods Used to Collect/Select the Evidence" field for the review questions.

Methods Used to Assess the Quality and Strength of the Evidence

Expert Consensus

Rating Scheme for the Strength of the Evidence

Not applicable

Methods Used to Analyze the Evidence

Meta-Analysis

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

Note from the National Guideline Clearinghouse (NGC): This guideline was developed by the National Clinical Guideline Centre (NCGC) at the National Institute for Health and Clinical Excellence (NICE). See the "Availability of Companion Documents" field for the full version of this guidance.

Review Appendix E of the full version of the original guideline document for detailed evidence tables and forest plots for the review questions.

Methods Used to Formulate the Recommendations

Expert Consensus

Description of Methods Used to Formulate the Recommendations

Note from the National Guideline Clearinghouse (NGC): This guideline was developed by the National Clinical Guideline Centre (NCGC) at the National Institute for Health and Clinical Excellence (NICE). See the "Availability of Companion Documents" field for the full version of this guidance.

Forming and Running the Short Clinical Guideline Development Group (GDG)

Each short clinical guideline is developed by a unique GDG consisting of 10–12 members, supported by the Short Clinical Guidelines Team. Each GDG has a Chair, healthcare professional members and a minimum of two patient and carer members. Co-opted expert advisers are recruited, as appropriate. A Clinical Adviser, who has specific content expertise and additional responsibilities, may also be appointed depending on the topic. Recruitment of the GDG Chair and members is carried out in accordance with NICE's policy.

The GDG makes its decisions using the best available evidence presented to it at GDG meetings by the Short Clinical Guidelines Team. The use of formal consensus methods within the GDG will be considered on a case-by-case basis.

Developing Review Questions

A short clinical guideline has a narrow scope and covers only part of a care pathway. It addresses a maximum of three subject areas covering clinical management. This will result in a small number of key clinical issues. These are broken down into a defined number of review questions — usually one or two per clinical management area. The exact number will be dictated by the size of the short clinical guideline remit and the amount of development time available.

Creating Guideline Recommendations

Explicit methods of linking the evidence to recommendations are used for short clinical guidelines if the topic is suitable. This involves using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach.

Research recommendations are formulated for short clinical guidelines. Their number is dependent on the size of the short clinical guideline remit and the amount of development time available.

Writing the Guideline

There are usually three versions of short clinical guidelines:

- The full guideline – all the recommendations, details of how they were developed and summaries of the evidence they are based on.
- The quick reference guide – a summary of the recommendations for healthcare professionals.
- 'Understanding NICE guidance' – a summary for patients and carers.

The full guideline is written by the Short Clinical Guidelines Team, following the principles in chapters 9 and 10 of 'The guidelines manual' (see the "Availability of Companion Documents" field).

Rating Scheme for the Strength of the Recommendations

Not applicable

Cost Analysis

Adults with Acute Coronary Syndromes and Hyperglycaemia with a Diagnosis of Diabetes

After careful consideration and discussion, the Guideline Development Group (GDG) concluded that the evidence did not show intensive insulin therapy to be significantly associated with a reduction in outcomes such as inpatient mortality, long-term mortality and reinfarction. The GDG also took into account the increased risk of harm (hypoglycaemia) associated with intensive insulin therapy. The GDG recommended that intensive insulin therapy should not be routinely used to manage hyperglycaemia in people with pre-existing diabetes who present with a primary diagnosis of acute coronary syndromes (ACS).

It would be inappropriate to conduct an economic analysis because there is a lack of evidence to support the use of intensive insulin therapy, and it is clearly more expensive than standard care. The incremental cost of using intensive insulin therapy to manage hyperglycaemia in patients with ACS and pre-existing diabetes was estimated to be £103. Table 3 in the full version of the original guideline document provides an estimate of resource use and unit costs for managing hyperglycaemia using intensive insulin therapy compared with standard care.

Intensive insulin therapy is defined as an intravenous infusion of insulin and glucose with or without potassium. Based on GDG consensus, standard care (current practice) for people with pre-existing diabetes would include pre-filled insulin, diabetes specialist nurse time and an intravenous cannula. Those on intensive insulin therapy will require 12–24 glucose strip tests daily compared with 8–12 a day for standard care. Thus up to 24 additional test strips would be needed over 48 hours for intensive insulin therapy. See table 3 in the full version of the original guideline document for further details.

Adults with Acute Coronary Syndromes and Hyperglycaemia without a Previous Diagnosis of Diabetes

The review of clinical evidence did not show intensive insulin therapy to be more effective than standard care in managing hyperglycaemia in patients presenting with ACS without pre-existing diabetes.

It would be inappropriate to conduct an economic analysis because there is a lack of evidence to support the use of intensive insulin therapy and it is clearly more expensive than standard care. The incremental cost of using intensive insulin therapy to manage hyperglycaemia in patients with ACS without pre-existing diabetes was estimated to be £85.15 per hospital stay (see Table 6 in the full version of the original guideline document).

The GDG recommended that intensive insulin therapy should not be routinely used to manage hyperglycaemia in patients presenting with ACS without pre-existing diabetes. Table 6 in the full version of the original guideline provides an estimate of resource use and unit cost of managing hyperglycaemia using intensive insulin therapy compared with standard care.

Intensive insulin therapy is defined as an intravenous infusion of insulin and glucose with or without potassium. Based on GDG consensus, people without pre-existing diabetes would neither receive insulin nor need care from a diabetes nurse as part of standard care. Those on intensive insulin therapy would need 12–24 glucose strip tests daily compared with 2–4 a day for standard care. Thus up to 40 additional test strips would be needed over 48 hours for those on intensive insulin therapy. See Table 3 in the full version of the original guideline for further details.

Identifying People who are at High Risk of Developing Diabetes

No health economic analysis was conducted for this question.

Patient Information

No health economic analysis was conducted for this question.

Method of Guideline Validation

External Peer Review

Internal Peer Review

Description of Method of Guideline Validation

The guideline was validated through two consultations.

1. The first draft of the guideline (the full guideline, National Institute for Health and Clinical Excellence [NICE] guideline, and Quick Reference Guide) were consulted with Stakeholders and comments were considered by the Guideline Development Group (GDG)
2. The final consultation draft of the Full guideline, the NICE guideline and the Information for the Public were submitted to stakeholders for final comments.

The final draft was submitted to the Guideline Review Panel for review prior to publication.

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The type of evidence supporting the recommendations is not specifically stated.

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

Appropriate management of patients admitted to hospital for acute coronary syndrome who have hyperglycaemia

Potential Harms

- Adverse events associated with metabolic management of hyperglycaemia, including hypoglycaemia and hypokalaemia
- Risk of adverse events associated with hyperglycaemia that is not managed appropriately

Qualifying Statements

Qualifying Statements

- This guidance represents the view of the National Institute for Health and Clinical Excellence (NICE), which was arrived at after careful consideration of the evidence available. Healthcare professionals are expected to take it fully into account when exercising their clinical judgement. However, the guidance does not override the individual responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient, in consultation with the patient and/or guardian or carer, and informed by the summary of product characteristics of any drugs they are considering.
- Implementation of this guidance is the responsibility of local commissioners and/or providers. Commissioners and providers are reminded that it is their responsibility to implement the guidance, in their local context, in light of their duties to avoid unlawful discrimination and to have regard to promoting equality of opportunity. Nothing in this guidance should be interpreted in a way that would be inconsistent with compliance with those duties.
- The guideline does not make recommendations on drug dosage; prescribers should refer to the "British national formulary" for this information. The guideline also assumes that prescribers will use a drug's summary of product characteristics to inform decisions made with individual patients.

Implementation of the Guideline

Description of Implementation Strategy

The National Institute for Health and Clinical Excellence (NICE) has developed tools to help organisations implement this guidance (see http://guidance.nice.org.uk/CG130 ; see also the "Availability of Companion Documents" field).

Implementation Tools

Audit Criteria/Indicators

Chart Documentation/Checklists/Forms

Clinical Algorithm

Foreign Language Translations

Patient Resources

Resources

Slide Presentation

For information about availability, see the *Availability of Companion Documents* and *Patient Resources* fields below.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Getting Better

Living with Illness

IOM Domain

Effectiveness

Patient-centeredness

Timeliness

Identifying Information and Availability

Bibliographic Source(s)

National Institute for Health and Clinical Excellence (NICE). Hyperglycaemia in acute coronary syndromes. Management of hyperglycaemia in acute coronary syndromes. London (UK): National Institute for Health and Clinical Excellence (NICE); 2011 Oct. 19 p. (Clinical guideline; no. 130).

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

2011 Oct

Guideline Developer(s)

National Institute for Health and Care Excellence (NICE) - National Government Agency [Non-U.S.]

Source(s) of Funding

National Institute for Health and Clinical Excellence (NICE)

Guideline Committee

Guideline Development Group

Composition of Group That Authored the Guideline

Guideline Development Group: Damien Longson (*Chair*), Consultant Liaison Psychiatrist, Manchester Mental Health and Social Care Trust; Sunil Angris, GP, Staffordshire; Bernard Clarke, Consultant Cardiologist, Central Manchester University Hospital NHS Foundation Trust; Simon Corbett, Consultant Cardiologist, Wessex Cardiothoracic Centre, Southampton University Hospitals NHS Trust; Phillip Dyer, Consultant Physician, Heart of England NHS Foundation Trust, Birmingham; Ian Lewin, Consultant Physician, North Devon Healthcare NHS Foundation Trust; Lesley Mills, Senior Diabetes Nurse Specialist, Warrington and Halton Hospitals NHS Foundation Trust; David Peachey, Patient member; Steven Williams, Consultant Pharmacist in Medicine and Medication Safety, University Hospital of South Manchester NHS Foundation Trust

Financial Disclosures/Conflicts of Interest

See Appendix A in the full version of the original guideline for a list of all declarations made by members of the Guideline Development Group.

Guideline Status

This is the current release of the guideline.

Guideline Availability

Electronic copies: Available from the National Institute for Health and Clinical Excellence (NICE) Web site .

Availability of Companion Documents

The following are available:

- Hyperglycaemia in acute coronary syndromes. Management of hyperglycaemia in people with acute coronary syndromes. Full guideline. London (UK): National Institute for Health and Clinical Excellence (NICE); 2011 Oct. 64 p. (Clinical guideline; no. 130). Electronic copies: Available in PDF from the NICE Web site .
- Hyperglycaemia in acute coronary syndromes. NICE pathway. London (UK): National Institute for Health and Clinical Excellence (NICE); 2011 Oct. Various pages. (Clinical guideline; no. 130). Electronic copies: Available from the NICE Web site .
- Hyperglycaemia in acute coronary syndromes. Baseline assessment. Implementing NICE guidance. London (UK): National Institute for Health and Clinical Excellence (NICE); 2011. Various p. (Clinical guideline; no. 130). Electronic copies: Available from the NICE Web site .
- Hyperglycaemia in acute coronary syndromes. Clinical audit tool. Implementing NICE guidance. London (UK): National Institute for Health and Clinical Excellence (NICE); 2011. 9 p. (Clinical guideline; no. 130). Electronic copies: Available from the NICE Web site .
- Hyperglycaemia in acute coronary syndromes. Costing statement. Implementing NICE guidance. London (UK): National Institute for Health and Clinical Excellence (NICE); 2011 Oct. 7 p. (Clinical guideline; no. 130). Electronic copies: Available in Portable Document Format (PDF) from the NICE Web site .
- Hyperglycaemia in acute coronary syndromes. Electronic audit tool. Implementing NICE guidance. London (UK): National Institute for Health and Clinical Excellence (NICE); 2011. Various p. (Clinical guideline; no. 130). Electronic copies: Available from the NICE Web site .
- Hyperglycaemia in acute coronary syndromes. Implementing NICE guidance. Slide set. London (UK): National Institute for Health and

Clinical Excellence (NICE); 2011 Oct. 21 p. (Clinical guideline; no. 130). Electronic copies: Available from the NICE Web site .

- The guidelines manual 2009. London (UK): National Institute for Health and Clinical Excellence (NICE); 2009 Jan. Electronic copies: Available in PDF from the NICE Archive Web site .

Patient Resources

The following is available:

- High blood glucose after an acute coronary syndrome: understanding NICE guidance. Information for people who use NHS services. London (UK): National Institute for Health and Clinical Excellence; 2011 Oct. 8 p. (Clinical guideline; no. 130). Electronic copies: Available in English from the National Institute for Health and Clinical Excellence (NICE) Web site . Also available in Welsh from the NICE Web site .

Please note: This patient information is intended to provide health professionals with information to share with their patients to help them better understand their health and their diagnosed disorders. By providing access to this patient information, it is not the intention of NGC to provide specific medical advice for particular patients. Rather we urge patients and their representatives to review this material and then to consult with a licensed health professional for evaluation of treatment options suitable for them as well as for diagnosis and answers to their personal medical questions. This patient information has been derived and prepared from a guideline for health care professionals included on NGC by the authors or publishers of that original guideline. The patient information is not reviewed by NGC to establish whether or not it accurately reflects the original guideline's content.

NGC Status

This NGC summary was completed by ECRI Institute on April 25, 2012.

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